1,066,657

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,066,657

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Int. Cl.:—H 02 m 3/00, H 02 m 7/68

COMPLETE SPECIFICATION

Improvements in and relating to Direct Voltage Conversion

We, BROWN BOVERI & COMPANY LIMITED, of Baden, Switzerland, a Swiss Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to direct voltage converters, i.e. apparatus for converting a d.c. voltage into a d.c. voltage of different value.

Electric locomotives and other vehicles which receive d.c. power from a contact wire and a current collector, normally require converters for converting the d.c. supply voltage to a voltage of a value suitable for supplying drive motors and/or auxiliary apparatus of the vehicle. For example the d.c. supply may be converted into a d.c. voltage of lower value. Such converters usually use grid controlled gas discharge rectifier tubes or semiconductor controlled rectifiers, together with commutation means to ensure zero passage of the current. The commutation means consists essentially of means for storing energy, usually an arrangement of capacitors and choke coils, which is charged by the supply voltage. However an electric railways the contact wire voltage can fluctuate greatly, and bouncing of the current collector can even make the supply to the vehicle cease momentarily. Such supply voltage changes, especially if sudden or involving a cessation of supply, can cause commutation failure in the rectifiers.

The present invention consists in a self-controlled direct voltage conversion system for use with a d.c. power source liable to voltage fluctuations, including a first d.c. to d.c. converter which in use is supplied from the said source and whose d.c. output serves to charge a storage battery, and a second d.c. to d.c. converter connected to the battery and to the first converter and so arranged that in use the battery voltage is supplied to the second converter which supplies the converted battery voltage to the input of the first converter.

[P... ...]

Either or each converter may be a direct d.c. to d.c. converter or a rectifier - inverter combination with an intermediate a.c. circuit from which a.c. equipment can be supplied.

The invention will be further described, by way of example, with reference to the accompanying drawings, in which Figures 1 to 4 are respectively block diagrams of four direct voltage conversion systems embodying the invention. Throughout the drawings corresponding parts are indentified by the same reference numerals and letters.

Figure 1 shows a d.c. conversion system for a locomotive to which d.c. power is supplied from a wire 4 by a collector bow 5. A d.c. - d.c. conveter 1 converts the d.c. supply to d.c. of a lower voltage, supplied at A for use in the drive motors and auxiliary equipment of the locomotive. The d.c. output also serves to charge a storage battery 3 which is connected to the input of a second d.c. converter 2 whose output is connected to the input of converter 1 to form a closed loop. The direction of flow of power is shown by arrows, the converters being so connected and controlled that such flow can occur.

The second converter 2 comes into operation immediately should the supply from the collector 5 momentarily cease or change in such a way that commutation failure would otherwise occur in converter 1. That is to say, the second converter converts the d.c. voltage of battery 3 into a d.c. voltage suitable for maintaining converter 1 in operation, so that the output at A is maintained without a break. Separation of the supply voltage requires that converter 1 have separate inputs, as indicated by the two input connections in Figure 1.

If converter 1 has only one input connection, the second converter must be decoupled from the current collector. Figure 2 shows how this can be done by inserting uncontrolled rectifiers 6, 7 in the supply leads from the collector and the second converter respectively, the arrangement of these rectifiers being such that the

higher of the voltages in these two leads is effective as input voltage for converter 1, the lower voltage being restricted to its own lead by the consequent reverse bias applied to the associated rectifier. Otherwise the system shown in Figure 2 is similar to that of Figure 1.

Figure 3 shows a system similar to that of Figure 2 except that converter 1 is replaced by a combination of an inverter 1*a* connected to a rectifier 1*b* by an a.c. intermediate circuit, so that an a.c. output can be obtained at A, battery 3 being continuously charged by the d.c. output of rectifier 1*b*.

Figure 4 shows a system similar to that of Figure 3 except that converter 2 is replaced by a combination of an inverter 2*a* and a rectifier 2*b* connected by an a.c. intermediate circuit. Rectifier 1*b* charges battery 3 which in turn provides the input voltage for inverter 2*a*. Since there are two a.c. intermediate circuits two a.c. outputs A_1 and A_2 of different voltages can be provided; for example output A_1 may supply drive motors while A_2 supplies auxiliary equipment.

WHAT WE CLAIM IS:—

1. A self-controlled direct voltage conversion system for use with a d.c. power source liable to voltage fluctuations, including a first d.c. to d.c. converter which in use is supplied from the said source and whose d.c. output serves to charge a storage battery, and a second d.c. to d.c. converter connected to the battery and to the first converter and so arranged that in use the battery voltage is supplied to the second converter which supplies the converted battery voltage to the input of the first converter.

2. A direct voltage conversion system as claimed in claim 1 in which at least one of the converters consists of an inverter whose output is connected by an intermediate a.c. circuit to a rectifier.

3. A direct voltage conversion system as claimed in claim 1 or 2 in which the first converter has a single input connected by respective supply leads to the source and to the output of the second converter, and in which a respective rectifier is connected in each supply lead.

4. A self-controlled direct voltage conversion system substantially as hereindescribed with reference to any one Figure of the accompanying drawings.

MARKS & CLERK,
Chartered Patent Agents,
Agents for the Applicants.

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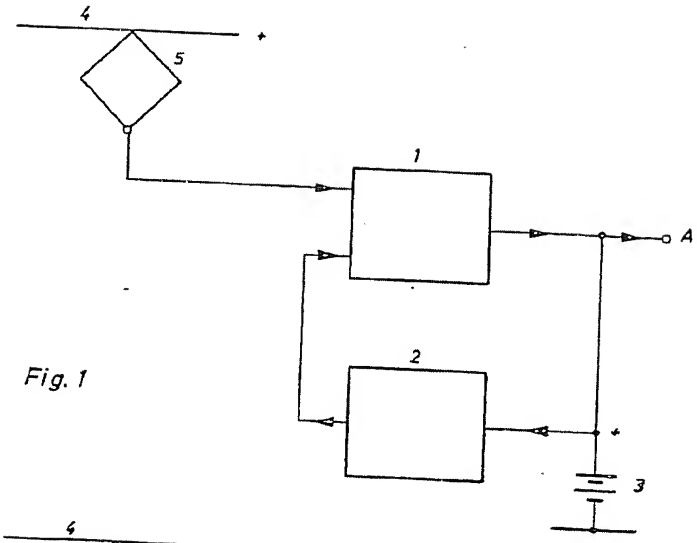

Fig. 1

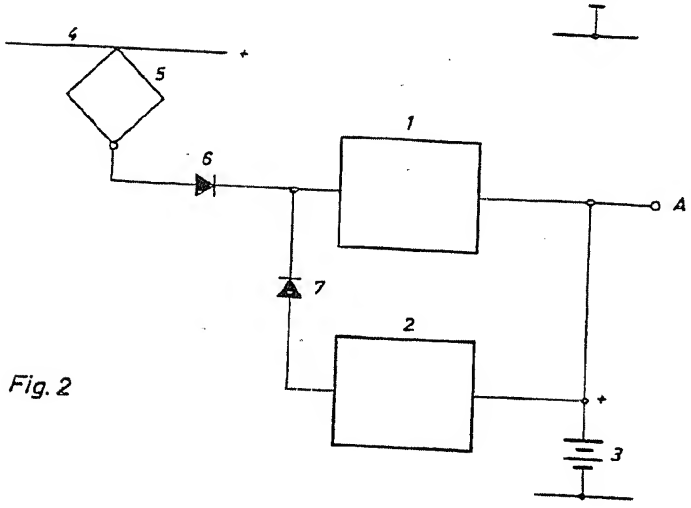

Fig. 2

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

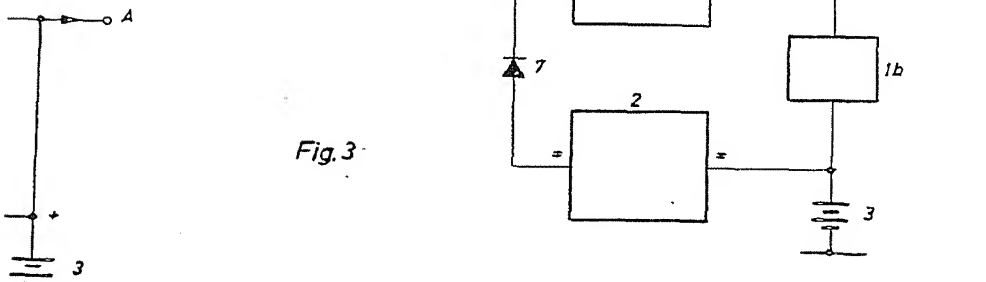


Fig. 3

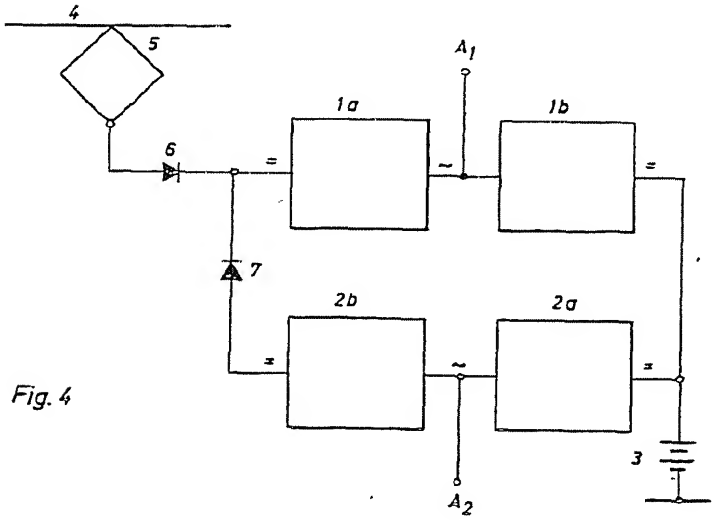
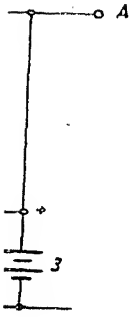


Fig. 4



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2 SHEETS This drawing is a reproduction of the Original on a reduced scale

Sheets 1 & 2

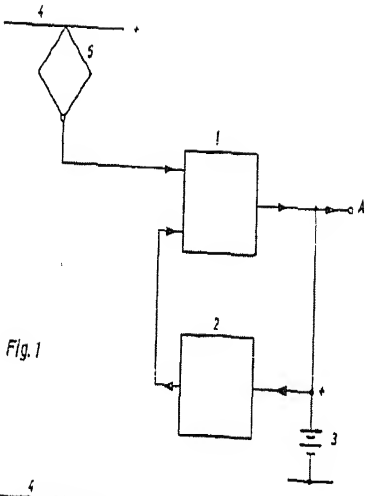

Fig. 1

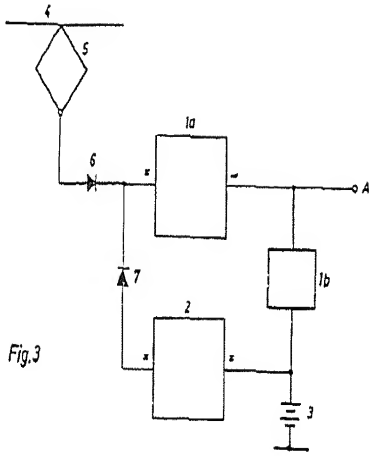

Fig. 3

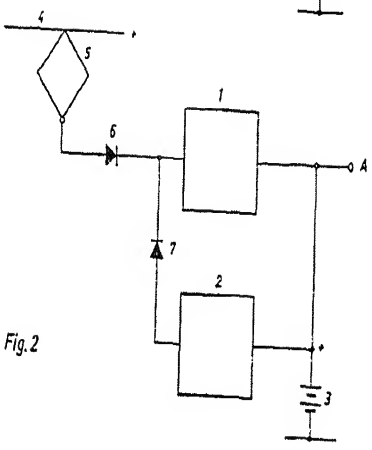

Fig. 2

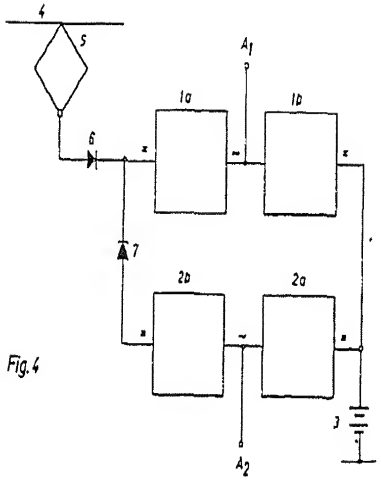

Fig. 4